August 26, 2022

Mr. Aaron Gilbert
U.S. Environmental Protection Agency
5 Post Office Square, Suite 100
Mail Code: OSRR07-2
Boston, MA 02109-3912

RE: Supplemental Investigation Work
RCRA Corrective Action/ TSCA
Former Ciba-Geigy Facility, 180 Mill Street, Cranston, Rhode Island Dear

Mr. Gilbert:

This letter summarizes the planned RCRA Corrective Action/ TSCA Supplemental Investigations that were presented to the USEPA and RIDEM on behalf of BASF on May 26, 2022. This document includes a concise field implementation work plan, analytical data quality objectives, and an implementation schedule. The field activities documented herein will be completed in accordance with Fuss & O'Neill's EPA-approved Generic Quality Assurance Project Plan for Projects in Connecticut, Massachusetts and Rhode Island, dated October 2019.

Background

Project background is provided in the presentation to the EPA and DEM on 5/26/2022.

1.0 Objectives

This work plan was prepared to achieve the following objectives.

- Characterize DNAPL nature and extent and mobility potential (CVOCs and PCBs),
- Characterize groundwater discharge pathways and constituent mass flux to the Pawtuxet River under and through the bulkhead,
- Given the above, the proposed investigation activities are targeted to assist with designing remedial actions to address the following:
    - DNAPL mobility and as a source to groundwater
    - PCB mobility and as a source to groundwater
    - Maintain mass flux control until MNA can be implemented.

2.0 Proposed Supplemental Investigation Activities

The field work activities will consist of the elements detailed below. Modifications to the supplemental investigation program based on the observed field conditions will be documented and summarized in a summary completion report. The observed field conditions will determine the final locations and

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modifications of investigation locations (soil borings, monitoring wells, piezometers), and will determine the sample locations. The presence of DNAPL, depth of groundwater, and soil lithology may change the field implementation so that the investigation activities are conducted to adequately characterize the Site. The proposed investigation locations are included as *Figure 1*.

Field work activity implementation will start with the dye testing to help determine whether groundwater flow paths and/or breakthrough is occurring through the sheet pile wall. Following the dye test, the upland soil boring and monitoring well installation will be conducted with locations and depths further informed from results of the dye testing. River piezometer installation will then be conducted based on the observations made during the dye testing, soil boring, and monitoring well activities. The piezometer locations may be adjusted based on field observations. The groundwater and surface water sampling will be completed once the remainder of the field activities have been completed, as detailed below.

Dye Testing - Dye testing will be conducted to identify preferred groundwater flow paths through the sheet piling (if any) in the vicinity of the PRB wells and DNAPL. The dye testing is intended to be a qualitative observation to document significant flow pathways through the sheeting. The sheet pile wall is an important component of the hydrology at the Site, as it affects the groundwater flow paths between the upland and the river. The dye test task is intended to be a qualitative methodology to evaluate the integrity of the sheet pile wall to determine if there are areas along the reach through which groundwater discharges. Observed discharges apparent from the upland side will subsequently be characterized spatially through boring, piezometer and monitoring well installations. The dye test will be implemented in parallel with other characterization tasks, and invasive field work will be modified, as needed, to characterize dye discharge over time. BASF will provide EPA periodic updates on the results of the dye test and intended modifications to the field plan, the goal being to characterize the hydrologic influence of the sheet pile wall and position monitoring equipment to characterize groundwater discharge.

- Green rhodamine dye will be introduced at the water table against the land side of the sheeting at select locations
- Shallow soil borings will be advanced in the soil directly adjacent to the sheeting. A dye water mixture will be added to the open boreholes and flooded with additional water. The dye-water mixture will be allowed to percolate into the soil adjacent to the sheeting.
- The Pawtuxet River will be observed over the course of entire field program to check for dye break out through the sheeting.
- Break-out of the dye through the sheet pile wall into the river will be documented, photographed, and used to aid positioning of groundwater monitoring wells and refining the site conceptual model.
- The dye test locations will be determined in the field. Additional locations may be added based on results of the initial dye tests.

- **Upland Geoprobe DNAPL and Soil Investigation -** Proposed soil boring locations will be advanced to fill data gaps and further understand distribution of DNAPL, VOCs, and PCBs. Proposed soil boring locations are included in *Figure 1* attached.
  - A minimum of 8 soil borings and four (4) monitoring wells will be installed to define the extent of DNAPL and PCBs.
  - A subcontracted drilling contractor will utilize a Geoprobe® drill rig to advance 4.5-inch diameter soil borings via direct push.

- 48-inch long continuous cores will be collected using dedicated acetate liners.
- The proposed soil boring locations may be adjusted based on results of the dye test.
- The soil borings will be advanced to ~20 fbgs and will not be advanced deep enough to penetrate the aquitard.
- Soil will be screened in the field via a photo-ionization detector and will be evaluated for grain size, moisture, and presence of DNAPL. DNAPL will be identified via visual field observations, odor, and PID readings.
- Flexible wall permeability testing will be conducted on soil core samples at representative wells/borings to further evaluate hydraulic conductivities of the various hydrogeologic units at the Site.
- Discrete/grab soil samples will be collected for laboratory analyses representative of two-foot increments from the base of TP-5 PCB excavation to the bottom of the boring, see approximate depths below. VOC samples will be collected via coring device to minimize soil disturbance during sample collection.
- Additional step-out soil borings will be advanced based on field observations, previous investigation results, and data gaps as needed to define nature and extent of contamination.

- **Proposed Soil Sample Collection –** An estimated32 soil samples will be analyzed for VOCs (EPA Method 8260) and PCBs (Method 8082 with Soxhlet Extraction). Additional samples will be held by laboratory and analyzed as needed based on lab results. The proposed soil samples are included below:

Table 1 – Soil Boring Sampling Program

Sampling Locations	Minimum Sample Analysis Intervals (fbgs)	Analytical Parameters
Proposed borings – FSB-01 through FSB-08	14-16, 16-18, 18-20, 20-22, (32 Samples)	VOCs – USEPA Method 8260 PCBs – USEPA 8082, w/Soxhlet Extraction

- **Groundwater Monitoring Wells –** Groundwater monitoring wells will be installed in a subset of the soil borings. The groundwater monitoring well locations will be refined based on field observations and dye test results. The proposed monitoring well locations are included in *Figure 1* attached.
  - A minimum of four shallow monitoring wells will be installed to define the extent of VOC and PCB concentrations in groundwater near the DNAPL.
  - Monitoring wells will be installed via a Geoprobe® direct-push drill rig. The wells will consist of 2- inch diameter PVC well casing and screen (stainless steel screen in DNAPL areas) and will include a sand pack around the screen, a bentonite seal and grout above the sand pack/screened interval. The groundwater monitoring wells will

be installed via conventional methods. If soil collapse within the borehole is either observed or becomes problematic, casing will be driven to ensure proper placement of the monitoring wells.
    - Shallow monitoring wells will be screened (5-foot screen) in the upper sand unit, where the DNAPL zone has been identified, just above the aquitard.
    - Monitoring wells installed in the DNAPL zone will be constructed with stainless steel well screens.
    - Monitoring wells will be completed with stick-up protective steel casings.
    - Slug testing will be conducted at representative wells/borings to further evaluate hydraulic conductivities of the various hydrogeologic units at the Site.

- **River Well /Piezometer Installation –** Additional piezometers will be installed to further refine the extent of the dissolved groundwater plume and evaluate contaminant flux to the river. The proposed piezometer locations are included in *Figure 1* attached.
    - Five piezometers/wells will be installed on the river side of the bulkhead via drive and wash methods utilizing a specially equipped drill rig with a cantilevered rear drilling platform designed for this application to further characterize the dissolved groundwater plume.
    - Soil will be screened in the field via a photo-ionization detector and will be evaluated for grain size, moisture, and presence of DNAPL.
    - Shallow piezometers will be screened in the upper sand unit and adjacent to the bulkhead at the elevation of the landside DNAPL.
    - The goal is to set the well screens in the deep piezometers below the elevation of the sheeting and into the sands just below the aquitard layer. The total depth of the piezometers will be based on the field conditions, including PID readings and geology.
    - Deeper piezometers will be installed below the sheeting depth and the aquitard layer if DNAPL is not present. The boreholes above the screen will be grouted.
    - The piezometers will be finalized as protective well stick-ups to allow for future access.
    - The piezometers will be accessed from the upland side of the bulkhead wall. The piezometer stickups will be adhered to the bulkhead wall to protect them from storm events and potential ice damage.

- **Proposed Piezometer Soil Sample Collection** - Soil samples will be collected continuously from river bottom to below the bottom of sheeting and aquitard at each well cluster via 2-foot long split-spoon samplers.
    - The goal is to evaluate soil conditions and to monitor mass flux through the bulkhead wall.
    - Samples to analyzed for PCBs and VOCs (approximately 27 samples).

Table 2 – Piezometer Soil Sampling Program

Sampling Locations	Sampling Intervals	Analytical Parameters
PZ-03D2, PZ-04D, PZ-05D	Every 2 feet from river bottom to below aquitard (~27 Samples)	VOCs – USEPA Method 8260 PCBs – USEPA 8082, w/Soxhlet Extraction

- **Groundwater and Surface Water Sampling**
    - **<u>Groundwater Sampling</u>**

One goal of the proposed work scope is to characterize PCB mobility in groundwater, either as a dissolved phase or as an adsorbed phase on mobile, colloidal-sized, solids. At this stage of the investigation all groundwater sample locations will be either from new or existing wells and piezometers. All new wells and piezometers will be installed with continuous coring and soil sampling for Aroclors via Method 8082 with Soxhlet Extraction. The soil data will be used to support in situ PCB mass characterization.

To understand whether a groundwater characterization based on Aroclor analysis using filtered samples from completed wells and piezometers is sufficient to meet the transport objective, the work plan will include the following water sampling protocols:

- All groundwater sample locations will include an unfiltered water sample for Aroclors via Method 8082 with Soxhlet Extraction
- 25% of the locations will add an unfiltered split sample for congeners via Method 1668.
- 25% of the locations will add a filtered sample for Aroclors via Method 8082 with Soxhlet Extraction utilizing a dedicated 5 micron in-line filter.

The unfiltered data will determine the presence of PCB mass present in groundwater either adsorbed or dissolved. The filtered data will quantify the mobile PCB fraction dissolved and adsorbed on colloidal-sized particles. The congener analysis will quantify PCB mobility for that mass fraction that is not represented in Aroclor analysis. Groundwater sampling protocols from wells and piezometers will be revised, as necessary, based on these initial data.

- Groundwater samples to be collected at 14 monitoring wells and piezometer locations, existing and new.
- A synoptic water level event will be recorded.

- All monitoring wells will be gauged with an interface probe prior to sampling to check for the presence of DNAPL.
- Dedicated sampling devices (e.g. tubing) will be used to collect samples.
- Samples to be collected via low-flow sampling methodology at each location via a peristaltic pump in accordance with our SOPs, which is consistent with EPA guidance.
- Low-flow parameters will be collected to ensure stabilization prior to sample collection (DO, pH, temperature, specific conductivity, ORP, depth to groundwater)

- **Surface Water Sampling -** Surface water samples will be collected at an upstream and downstream location (2 samples). The samples will be collected from shore with a long-handled scoop sampler. Each sample will be collected upstream of the sampler, so as not to disturb the sample during collection. The downstream samples will be collected before upstream samples. The surface water samples will be collected in accordance with Fuss & O'Neill's flowing surface water sampling SOP.
- Samples will be collected via dedicated sampling devices
- River stage will be recorded at the time of sampling.
- Surface water sampling will be completed in concert with groundwater sample collection

Table 3 – Groundwater and Surface Water Sampling Program

Sampling Locations	Analytical Parameters
Existing wells/surface water locations – SW-01, SW-02, PZ-8I, PZ-01DR- PZ-01SR, PZ-03DR, and PZ-03SR. New wells – PZ-01D2, PZ-04D, PZ-04S, PZ-05D, PZ-05S FSBs (4) (Total 16 samples)	**Unfiltered samples at all groundwater and surface water locations to be analyzed for VOC (EPA Method 8260) and PCBs (Aroclors via EPA Method 8082 with Soxhlet). An additional 25% of the samples to be analyzed as filtered, and an additional 25% to be analyzed for PCBs via EPA Method 1668 for congeners.** **25% of groundwater samples to be analyzed for pH, temperature, DO, ORP, turbidity, sulfate, sulfide, total and dissolved iron and manganese, total organic carbon, chloride, TDS, alkalinity, ammonia, nitrate, nitrite, total kjeldahl nitrogen, TPH, methane, and orthophosphate**

The expanded general chemistry list for groundwater samples is intended to provide data to assist with the evaluation of potential remedial treatment options, if deemed necessary. The groundwater level measurements will assist with determining the elevation of groundwater relative to the Pawtuxet River to support groundwater flow characterization. The upstream/downstream surface water samples will be analyzed for PCB and VOC only.

3.0 Quality Assurance / Quality Control

The field investigation sample collection, preservation, and analysis will be completed in accordance with the following quality assurance / quality control (QA/QC) measures and in accordance with Fuss & O'Neill's USEPA approved Generic QAAP[1] (EPA RFA Number 19120) for projects in Connecticut, Massachusetts, and Rhode Island, dated October 2019. Field samples including soil, groundwater, and surface water will be sent to Phoenix Environmental Laboratory (Phoenix) of Manchester, Connecticut under chain of custody command. Phoenix is a Rhode Island Department of Health certified laboratory. Quality assurance and quality control measures will include the collection and analysis of trip blanks for samples collected and analyzed for VOCs. Matrix Spikes and Matrix Spike Duplicate (MS/MSD) samples will be collected and analyzed at a frequency in general conformance with Fuss & O'Neill's Generic QAPP. The QAPP specifies MS/MSD sample analysis for specific analytical laboratories (Pace Analytical and Phoenix Environmental Laboratories). For this project, we propose to include MS/MSD analyses on PCB and VOC samples at a frequency of one MS/MSD analysis per 20 primary samples.

4.0 Supplemental Investigation and Remedial Evaluation Report

Field progress and data will be shared with the EPA and DEM as it is compiled and as it informs data gaps and requires modifications to the plan to provide for a process-based site model upon which to make decisions on best management practice to address source loading and manage dissolved phase mass flux.

Upon completion of field activities, a summary report will be prepared by Fuss & O'Neill to compile the results of the supplemental investigation field activities and analytical data. Soil, sediment, groundwater, and surface water data will be compared to the Site MPSs. The report will include the following details included below:

- A summary of the investigation activities:
- An update of VOC and PCB distribution in soil and groundwater;
- A discussion of the nature and extent of DNAPL;
- Mass flux calculations for constituents in groundwater and calculated discharge to the Pawtuxet River;
- Data tables and figures to support comparison of results to MPSs. This will
- include preparing an updated cross section focused of the DNAPL area;
- Refinement of the Site conceptual model;
- Screening / review of remedial options and the presentation of a recommended option to complete the groundwater remedy and to comply with TSCA PCB regulations;
- An opinion on whether sediment remediation should be considered in the overall plan to close
- out the RCRA Corrective Action obligations;
- Recommended additional predesign investigations, as applicable; and

[1] Generic Quality Assurance Project Plan for Projects in Connecticut, Massachusetts, and Rhode Island, Revision 0.0, prepared by Fuss & O'Neill, October 2019.

Estimated costs, permitting requirements and schedule to implement the recommended options.

4.1 Schedule

The following RCRA Corrective Action/ TSCA Supplemental Investigation schedule was developed to provide key milestone dates for the implementation of field work and reporting. The proposed schedule I completed below:

- **Dye Testing** – August 2022
- **Upland Geoprobe DNAPL and Soil Investigation –** August 2022
- **River Well /Piezometer Installation -** August 2022
- **Groundwater and Surface Water Sampling –** September 2022
- **Supplemental Investigation and Remedial Evaluation Report –** October 2022

If you have any questions regarding the attached application, please contact the undersigned.

Sincerely,

Patrick Dowling, CPG
Associate

c. Joseph Guarnaccia, Ph.D., BASF
Katherine Woodward, USPA
Claire Willscher, USEPA
Bart Hoskins, USEPA
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ATTACHMENT A – Figure 1

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MS VIEW: | LAYER STATE: | PC3: AUTOCAD PDF (GENERAL DOCUMENTATION).PC3 STB/CTB: FO HALF.STB

FIGURE 4

PROJ. No.: 20201130.A10
DATE: JANUARY 2022

PROPOSED INVESTIGATIONS

FORMER CIBA-GEIGY
180 MILL STREET

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